

## Polychlorinated Dibenzo-*p*-dioxins, Polychlorinated Dibenzofurans, and Coplanar and Mono-ortho-substituted Polychlorinated Biphenyls

### General Information

Polychlorinated dibenzo-*p*-dioxins and dibenzofurans are two similar classes of chlorinated aromatic chemicals that are produced as contaminants or byproducts. They have no known commercial or natural use. Dioxins are primarily produced during the incineration or burning of waste; the bleaching processes used in pulp and paper mills; and the chemical syntheses of trichlorophenoxyacetic acid, hexachlorophene, vinyl chloride, trichlorophenol, and pentachlorophenol. Synthesis and heat-related degradation of polychlorinated biphenyls (PCBs) will produce furan byproducts. As a result of man-made environmental release and contamination, most soil and water samples reveal trace amounts of polychlorinated dibenzo-*p*-dioxins and dibenzofurans when advanced analytical techniques are applied. Releases from industrial sources have decreased approximately 80% since the 1980s. Today, the largest release of these chemicals occurs as a result of the open burning of household trash and municipal trash, landfill fires, and agricultural and forest fires.

The coplanar and mono-ortho-substituted polychlorinated biphenyls belong to the class of chlorinated aromatic hydrocarbon chemicals that once were used as electrical insulating and heat-exchange fluids. Production of PCBs peaked in the early 1970s and was banned in the United States after 1979. Together with the polychlorinated dioxins and furans, these two classes of PCBs are often referred to as “dioxin-like” chemicals because they act through a similar mechanism. In the environment, these dioxin-like chemicals are persistent and usually occur as a mixture of congeners (i.e., compounds that differ by numbers and positions of chlorine atoms attached to the dibenzo-*p*-dioxin, dibenzofuran, or biphenyl structures). Structural nomenclature is available at <http://www.epa.gov/toxteam/pcbld/consistent.htm>.

People in the general population are exposed primarily through ingestion of foods that are contaminated with polychlorinated dibenzo-*p*-dioxins and dibenzofurans as a result of the accumulation of these substances in the food chain including high-fat foods, such as dairy products, eggs, and animal fats, and some fish and wildlife. Breast feeding is a substantial source for infants (Beck et al., 1994). People have also been exposed as a result of industrial accidents (e.g., after an explosion in a factory in Seveso, Italy), the use of accidentally contaminated cooking oils (e.g., as occurred in Yusho in

Japan and Yucheng in Taiwan), the spraying of herbicides contaminated with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD, as Agent Orange in Vietnam), and the burning of PCBs contaminated with polychlorinated dibenzofurans, such as in old electrical transformers. Workplace exposures are rare today, and generally recognized standards for external exposure have not been established.

Because exposure to these chemicals is from a mixture of varying congeners, the effects due to specific individual congeners are difficult to determine (Masuda et al., 1998; Masuda 2001). However, these four groups of chemicals (polychlorinated dibenzo-*p*-dioxins, polychlorinated dibenzofurans, and the coplanar and mono-ortho-substituted polychlorinated biphenyls) are considered to act through a similar mechanism to produce toxic effects. These dioxin-like effects are thought to be mediated through an interaction with the aryl hydrocarbon receptor (AhR), particularly the induction of gene expression for cytochromes P450, CYP1A1 and CYP1A2. Dioxins and furans require four lateral chlorine atoms on the dibenzo-*p*-dioxin or dibenzofuran backbone to bind this receptor. The rank order of interaction with the AhR receptor by degree and position of chlorination is similar for both the dioxin and furan series, with greater effect exhibited with four or five chlorine atoms and with substitution at all four lateral positions. The coplanar polychlorinated biphenyls (unsubstituted at ortho positions) and the mono-ortho-substituted polychlorinated biphenyls (which contain a chlorine atom at one of the ortho positions) can achieve a planar configuration and also interact with the AhR receptor.

The variation in the effect on AhR among the dioxin-like chemicals is 10,000-fold, with TCDD and 1,2,3,7,8-pentachlorodibenzo-*p*-dioxin being the most potent. To compare potency, each of these congeners has been assigned a potency value relative to TCDD (toxic equivalency factor [TEF]). When a TEF is multiplied by the concentration of the congener, a toxic equivalency (TEQ) value is obtained. Thus, the dioxin-like toxicity contributed by each of the polychlorinated dibenzo-*p*-dioxins, dibenzofurans, and coplanar PCBs can then be compared. The sum of all congener TEQs in a specimen (total TEQ) can be used to compare dioxin-like activity among specimens. Many co-planar PCBs have lesser potency, but their concentrations are often much higher than concentrations of TCDD (Kang et al., 1997; Patterson et al., 1994), so their relative contribution to the total TEQ is potentially sizable.

Health effects of exposure to dioxins and furans in people have been observed as a result of industrial or accidental exposures involving large quantities of these chemicals. Chloracne, biochemical liver test abnormalities, elevated blood lipids, fetal injury, and porphyria cutanea tarda have been reported in many of the studies. In some of these exposures, endocrine, reproductive, and immunologic effects have also been suggested although with varying consistency (Baccarelli et al., 2002; Fierens et al., 2003; Kogevinas, 2001; Halperin et al., 1998; Michalek et al., 1999; Jung et al., 1998; Matsuura et al., 2001; Schnorr et al., 2001; Institute of Medicine, 2003). Congenital anomalies and intrauterine growth retardation were observed in offspring of Yucheng mothers exposed to cooking oil contaminated with electrical oil containing PCBs and dibenzofurans. Background levels of PCBs, and possibly dioxins, have been associated with impaired neurological development in newborns and children (Koopman-

Esseboom et al., 1997; Jacobsen and Jacobsen, 1996; Longnecker et al., 2003). A possible dioxin-induced neuropathy may occur in highly exposed adults (Michalek et al., 2001). Many organochlorine-type chemicals, including the dioxins, furans, and PCBs, are also considered to interact with estrogen receptors. Although human studies have yielded inconsistent findings for associations between dioxin exposure and disorders such as endometriosis (Eskenazi et al., 2002; Fierens et al., 2003; Johnson et al., 2001), animal studies have suggested a relationship (Rier and Foster, 2003). The mono-ortho-substituted PCBs (see Table 81) may also interact with estrogen-receptors in addition to their dioxin-like effects, and have been demonstrated to elevate liver enzymes in experimental animals (Parkinson et al., 1983). Carcinogenic, genetic, reproductive, and developmental effects have been observed in many animal studies although species differ dramatically in sensitivity to these

**Table 80. Polychlorinated Dibenzo-*p*-dioxins, Polychlorinated Dibenzofurans, and Coplanar and Mono-ortho-substituted Polychlorinated Biphenyls**

<b>Polychlorinated dibenzo-<i>p</i>-dioxins</b>	<b>CAS number</b>
1,2,3,4,6,7,8,9-Octachlorodibenzo- <i>p</i> -dioxin (OCDD)	3268-87-9
1,2,3,4,6,7,8-Heptachlorodibenzo- <i>p</i> -dioxin (HpCDD)	35822-46-9
1,2,3,4,7,8-Hexachlorodibenzo- <i>p</i> -dioxin (HxCDD)	39227-28-6
1,2,3,6,7,8-Hexachlorodibenzo- <i>p</i> -dioxin (HxCDD)	57653-85-7
1,2,3,7,8,9-Hexachlorodibenzo- <i>p</i> -dioxin (HxCDD)	19408-74-3
1,2,3,7,8-Pentachlorodibenzo- <i>p</i> -dioxin (PeCDD)	40321-76-4
2,3,7,8-Tetrachlorodibenzo- <i>p</i> -dioxin (TCDD)	1746-01-6
<b>Polychlorinated dibenzofurans</b>	<b>CAS number</b>
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	39001-02-0
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	67562-39-4
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	55673-89-7
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	70648-26-9
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	57117-44-9
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	72918-21-9
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	57117-41-6
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	60851-34-5
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	57117-31-4
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	51207-31-9
<b>Coplanar polychlorinated biphenyls (IUPAC number)</b>	<b>CAS number</b>
3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)	32774-16-6
3,3',4,4',5-Pentachlorobiphenyl (PCB 126)	57465-28-8
3,4,4',5-Tetrachlorobiphenyl (PCB 81)	70362-50-4
<b>Mono-ortho-substituted polychlorinated biphenyls (IUPAC number)</b>	<b>CAS number</b>
2,4,4'-Trichlorobiphenyl (PCB 28)	7012-37-5
2,3',4,4'-Tetrachlorobiphenyl (PCB 66)	32598-10-0
2,4,4',5-Tetrachlorobiphenyl (PCB 74)	32690-93-0
2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	32598-14-4
2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	31508-00-6
2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)	38380-08-4
2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)	69782-90-7
2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)	52663-72-6
2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)	39635-31-9

chemicals. The Institute of Medicine (2003) has determined that human epidemiologic evidence is sufficient for causally linking exposure from herbicides contaminated with TCDD to an increased risk for non-Hodgkin's lymphoma, Hodgkin's lymphoma, chronic lymphocytic leukemia, and soft tissue sarcoma. Generally, the increased risk for these cancers occurs in association with large exposures encountered in contaminated occupational settings or massive unintentional releases. Because of its exceptional potency and because it is the most studied dioxin or furan, TCDD is separately classified by the IARC as a known human carcinogen (Group 1) and by NTP as a known human carcinogen. Other polychlorinated dibenzo-*p*-dioxins and dibenzofurans have not been studied sufficiently for IARC to determine their carcinogenicity. Information about environmental levels and health effects is available online from ATSDR's Toxicological Profiles at <http://www.atsdr.cdc.gov/toxprofiles>. The U.S. EPA provides updated exposure and health assessments online at <http://www.epa.gov/ncea/pdfs/dioxin>.

#### **Interpreting Levels of Lipid-Adjusted Serum Polychlorinated Dibenzo-*p*-dioxins, Polychlorinated Dibenzofurans, Coplanar Polychlorinated Biphenyls, and Mono-ortho-substituted Polychlorinated Biphenyls Reported in the Tables**

Lipid-adjusted serum measurements and whole weight-based measurements of polychlorinated dibenzo-*p*-dioxins, dibenzofurans, and coplanar PCBs were measured in a subsample of NHANES 2001-2002 participants aged 20 years and older. Participants were selected within the specified age range to be a representative sample of the U.S. population. (Note: The NHANES 1999-2000 subsample included people aged 12-19 years and people aged 20 years and older. The NHANES 2001-2002 subsample does not include the 12-19 year-old age group). The generally low values reported here support the observation that human serum levels of polychlorinated dibenzo-*p*-dioxins, dibenzofurans, and PCBs have decreased by more than 80% since the 1980s (Aylward and Hays, 2002; Lorber, 2002).

Only the following polychlorinated dibenzo-*p*-dioxins, dibenzofurans, coplanar and mono-ortho-substituted polychlorinated biphenyls (IUPAC nomenclature) had demonstrable 90<sup>th</sup> percentile levels in the NHANES 2001-2002 subsample, and those in bold letters had sufficient data for calculating geometric means:

- **1,2,3,4,6,7,8,9-octachlorodibenzo-*p*-dioxin**
- **1,2,3,4,6,7,8-heptachlorodibenzo-*p*-dioxin**
- 1,2,3,4,7,8-hexachlorodibenzo-*p*-dioxin

- **1,2,3,6,7,8-hexachlorodibenzo-*p*-dioxin\***
- 1,2,3,7,8,9-hexachlorodibenzo-*p*-dioxin
- 1,2,3,7,8-pentachlorodibenzo-*p*-dioxin\*
- **1,2,3,4,6,7,8-heptachlorodibenzofuran**
- 1,2,3,4,7,8-hexachlorodibenzofuran
- 1,2,3,6,7,8-hexachlorodibenzofuran
- 2,3,4,7,8-pentachlorodibenzofuran\*
- **coplanar polychlorinated biphenyls 126\* and 169**
- mono-ortho substituted PCBs 74, 118\* and 156\*

About 80%-90% of the total TEQ can be estimated from six of the congeners (indicated by asterisks) listed above, plus an estimate of the TCDD level. Though the mono-ortho-substituted PCBs are less potent (i.e., lower TEFs), their contribution to the total TEQ is substantial since they are present in much higher concentrations than are the coplanar PCBs, dioxins, and furans. In keeping with results from reports from Germany (Papke et al., 1998), New Zealand (Bates et al., 2004b) and elsewhere, the NHANES 1999-2000 and 2001-2002 data show that the highly chlorinated and laterally substituted congeners are frequently detected. The presence of many of these congeners in human sera is probably due to their greater solubility in body fat and slower elimination (Geyer et al., 2002), but can also be due to their greater presence in the food chain. For example, people consuming fish from the Great Lakes had mean concentrations of dioxins and furans that are several times background values in the population (Falk et al., 1999; Anderson et al., 1998; Hanrahan et al., 1999).

Of the dioxins and furans, octachlorodibenzo-*p*-dioxin typically is present in the highest concentration but contributes little to the TEQ, with the other commonly detected dioxin and furan congeners being more than eight-fold lower in concentration. Similar levels of octachlorodibenzo-*p*-dioxin are seen in a representative pooled sampling of New Zealanders aged 15 years and older who were studied during 1997-1998. The weighted mean octachlorodibenzo-*p*-dioxin level in the New Zealand study was 361 picograms per gram (pg/g) lipid (Bates et al., 2004b) compared with the NHANES 2001-2002 median level of 349 pg/g lipid for non-Hispanic whites aged 20 years and older. On the other hand, 1,2,3,7,8-pentachlorodibenzo-*p*-dioxin concentrations in this *Report* are about 60-fold lower than octachlorodibenzo-*p*-dioxin levels (at the comparable percentiles), but because of a 10,000-fold greater TEF (equal to that of TCDD), the contribution of 1,2,3,7,8-pentachlorodibenzo-*p*-dioxin to the TEQ is about 160 times greater than the octachlorodibenzo-*p*-dioxin. In 1996, a small convenience sample of German residents aged 18-71 years showed that levels of 1,2,3,7,8-pentachlorodibenzo-*p*-dioxin at the 95<sup>th</sup> percentile were



9.9 pg/g lipid (Papke et al., 1998). Levels at the 95<sup>th</sup> percentile in the NHANES 2001-2002 subsample reported here were 15.8 pg/g.

The three major hexachlorodibenzo-*p*-dioxins are assigned equal TEF values, but the 1,2,3,6,7,8-hexachlorodibenzo-*p*-dioxin often demonstrates multifold higher concentrations than the other two hexachlorodibenzo-*p*-dioxins, about six-fold higher in the NHANES 2001-2002 subsample. The geometric mean levels of 1,2,3,6,7,8-hexachlorodibenzo-*p*-dioxin in the 2001-2002 subsample are slightly higher than levels in either the German or New Zealand study mentioned above (Papke et al., 1998; Bates et al., 2004b). A small convenience sample of Japanese men and women aged 20-76 years studied during 1996-1997 also showed lower median levels of 17 pg/g and 18 pg/g lipid, respectively, than levels in the NHANES 2001-2002 subsample (Arisawa et al., 2003).

For TCDD levels in the NHANES 2001-2002 subsample, only the 95<sup>th</sup> percentiles in women and non-Hispanic blacks could be characterized, which were 6.4 and 7.4, picograms/gram (pg/g) of lipid, respectively (detection limit of 5.8 pg/g of lipid). The remainder of the U.S. population is likely to be below these levels of this hallmark dioxin. In 1996, the 95<sup>th</sup> percentile for lipid-adjusted serum TCDD levels in 139 Germans aged 18-71 years was 4.3 pg/g of lipid, with that percentile comprising mainly older individuals (Papke, 1998). The TCDD levels in this *Report* are much lower than those for chemical-production workers even when they were examined 15 years after workplace exposure had ceased (median serum TCDD concentration = 68 pg/g of lipid) (Calvert et al., 1996). TCDD levels of chemical-plant workers exposed to high concentrations have ranged as high as 2,000 pg/g lipid (World Health Organization/IARC, 1997).

In the NHANES 2001-2002 subsample, the geometric mean levels of coplanar PCBs 126 and 169 for participants aged 20 years and older were similar or slightly lower than those reported from a representative pooled sample of New Zealanders in 1996-1997 (Bates et al., 2004b) and of a smaller sample of non-occupationally exposed men and women aged 20-76 years in Japan in 1999 (Arisawa et al., 2003). Of the mono-ortho-chlorine-substituted PCB congeners, the most frequently detected in general population studies are PCBs 118 and 156. Of these, PCB 118 levels were higher than PCB 156 in the NHANES 1999-2000 and 2001-2002 subsamples although PCB 156 contributes more to the TEQ because its TEF is five-fold greater than the TEF of PCB 118. Compared with levels in a convenience sample of the

U.S. population in 1988 (Patterson et al., 1994), levels of PCB 118 are at least five-fold lower in the NHANES 1999-2002 subsamples. The PCB 156 levels in the NHANES data for 1999-2002 are slightly lower than those reported for a Canadian population study in 1994 (Longnecker et al., 2000). Levels of PCB 156 and PCB 118 were slightly higher in a Swedish study of 150 men than in the NHANES 1999-2002 subsample possibly due to higher fish intake in the Swedish population (Glynn et al., 2000). However, in fish-consuming Japanese men and women studied during 1996-1997, PCB 118 levels were similar to levels in the NHANES 2001-2002 subsample at the comparable 75<sup>th</sup> percentiles (Arisawa et al., 2003).

As was the case for TCDD, levels of other polychlorinated dibenzo-*p*-dioxins, dibenzofurans, coplanar and mono-ortho-substituted biphenyls in this *Report* are below levels associated with occupational or unintentional exposures that produce health effects. There are no firmly established relationships between serum lipid-based concentrations (mainly considering TCDD) and effects in people. Studies of industrial and accidental exposures suggest that concentrations of at least 800 pg/g of lipid might be necessary to induce chloracne, a specific effect, although levels in the thousands of pg/g of lipid do not always produce this effect (Mocarelli et al., 1991). The studies showing clinical effects in people after large unintentional exposures have demonstrated concentrations ranging from several hundred to the tens of thousands of pg/g of lipid (Masuda 2001; Masuda et al., 1998; Mocarelli et al., 1991).

### Comparing Adjusted Geometric Means

For comparison of demographic groups in the NHANES 2001-2002 subsample, geometric means of whole weight-based serum measurements were adjusted for age, gender, race/ethnicity, log serum cotinine, and lipid level (data not shown). In NHANES 2001-2002, females had higher adjusted geometric mean levels than males for 1,2,3,4,6,7,8-heptachlorodibenzo-*p*-dioxin, and 3,3,4,4,5-pentachlorobiphenyl (PCB 126). However, males had higher levels than females for 3,3,4,4,5,5-hexachlorobiphenyl (PCB 169). In the previously mentioned study of Japanese adults, women demonstrated higher levels than men for the octachlorodibenzo-*p*-dioxin, 1,2,3,4,6,7,8-heptachlorodibenzo-*p*-dioxin and 1,2,3,7,8,9-hexachlorodibenzo-*p*-dioxin, but men had higher levels for PCBs 169, 156, and 189 (Arisawa et al., 2003). In NHANES 2001-2002, Mexican Americans had lower adjusted geometric mean levels than non-Hispanic blacks

and whites for 1,2,3,4,6,7,8-heptachlorodibenzofuran, 1,2,3,6,7,8-hexachlorodibenzo-*p*-dioxin, and 3,3,4,4,5,5-hexachlorobiphenyl (PCB 126). Also, non-Hispanic whites had lower levels than non-Hispanic blacks for 1,2,3,4,6,7,8-heptachlorodibenzofuran.

Differences in levels of specific polychlorinated dibenzo-*p*-dioxins, dibenzofurans, coplanar and mono-ortho-substituted polychlorinated biphenyls are due in part to exposure but also result from differences in absorption, tissue distribution, metabolism, and elimination. Half-lives for all the dioxins and furans vary from 3 years to 19 years, with the half-life of TCDD estimated at around 7 years (Geyer et al., 2002). Current levels may be influenced by both past (stored in body fat) and recent exposures. Several studies have shown that levels of dioxins and furans in serum or fat increase with the age of the individual (Falk et al., 1999; Kang et al., 1997; Luotamo et al., 1991; Patterson et al., 1986). Most of the dioxins, furans and PCBs measured in the previously mentioned New Zealand representative sample showed an increasing trend with age (Bates et al., 2004b). In part, this age trend was noticeable at the higher percentiles for the more highly chlorinated congeners in the NHANES 1999-2000 subsample which included both the groups aged 12-19 years and 20 and older.

Finding a measurable amount of one or more of the polychlorinated dibenzo-*p*-dioxins, dibenzofurans, coplanar or mono-ortho-substituted biphenyls in serum does not mean that the level of one or more of these causes an adverse health effect. Whether the concentrations reported here are a cause for health concern is not yet known; more research is needed. These levels provide physicians with a reference range so that they can determine whether or not people have been exposed to higher levels of polychlorinated dibenzo-*p*-dioxins, dibenzofurans, coplanar or mono-ortho-substituted biphenyls than levels found in the general population. These data will also help scientists plan and conduct research on exposure and health effects.

Notes: 1) As seen in other recent population studies, pooling of approximately 50 or more specimens is sometimes required to have adequate amounts of specimen to properly estimate a TEQ of dioxin-like compounds in the general population. Because of limited availability of serum volumes and the low levels detected in the NHANES 1999-2002 population, TEQ values are not estimated from this analysis of individual samples. Future plans include an analysis of pooled specimens to improve the LOD for these compounds and allow calculation of TEQ values. 2) PCB analyses by GC-high resolution mass spectrometry are usually specific for the

stated PCB congener. However, in some cases, multiple congeners of the same molecular weight could potentially contribute to the analytical result for a stated congener. Such potentially contributing congeners are not present in significant proportions in the environment or in the body and are unlikely to affect the stated results. Known situations would include: PCBs 158, 160, 163, and 164 contributing to the result for PCB 138; PCB 132 contributing to the result for PCB 153; PCB 190 contributing to the result for PCB 170; and PCB 203 contributing to the result for PCB 196.

**Table 81. 1,2,3,4,6,7,8,9-Octachlorodibenzo-*p*-dioxin (OCDD) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	<b>445</b> (389-496)	<b>704</b> (624-802)	<b>948</b> (822-1080)	1254
	01-02	<b>346</b> (<LOD-394)	<b>333</b> (<LOD-399)	<b>571</b> (498-668)	<b>939</b> (780-1090)	<b>1260</b> (997-1610)	1171
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	<b>421</b> (363-517)	667
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	<b>445</b> (389-496)	<b>704</b> (624-802)	<b>948</b> (822-1080)	1254
	01-02	<b>346</b> (<LOD-394)	<b>333</b> (<LOD-399)	<b>571</b> (498-668)	<b>939</b> (780-1090)	<b>1260</b> (997-1610)	1171
<b>Gender</b>							
(20 years and older)							
Males	99-00	*	< LOD	<b>331</b> (<LOD-378)	<b>541</b> (453-639)	<b>710</b> (572-873)	575
	01-02	*	< LOD	<b>438</b> (346-579)	<b>745</b> (593-968)	<b>1030</b> (837-1240)	517
Females	99-00	*	< LOD	<b>525</b> (475-608)	<b>846</b> (689-982)	<b>1050</b> (948-1290)	679
	01-02	<b>410</b> (356-472)	<b>405</b> (333-498)	<b>643</b> (574-731)	<b>1020</b> (858-1360)	<b>1450</b> (1060-1780)	654
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	99-00	*	< LOD	<b>471</b> (374-572)	<b>703</b> (608-916)	<b>940</b> (746-1190)	333
	01-02	*	< LOD	<b>432</b> (394-545)	<b>754</b> (578-1220)	<b>1150</b> (696-1640)	250
Non-Hispanic blacks	99-00	*	< LOD	<b>493</b> (405-566)	<b>820</b> (727-1070)	<b>1170</b> (820-1680)	226
	01-02	<b>421</b> (352-503)	<b>420</b> (339-509)	<b>669</b> (537-907)	<b>1110</b> (956-1520)	<b>1640</b> (1130-1900)	210
Non-Hispanic whites	99-00	*	< LOD	<b>427</b> (369-484)	<b>671</b> (581-800)	<b>913</b> (731-1080)	578
	01-02	<b>349</b> (<LOD-409)	<b>333</b> (<LOD-421)	<b>574</b> (493-670)	<b>945</b> (764-1170)	<b>1290</b> (971-1650)	632

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 82. 1,2,3,4,6,7,8,9-Octachlorodibenzo-*p*-dioxin (OCDD) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	<b>2800</b> (2480-3110)	<b>4570</b> (4100-5020)	<b>6200</b> (5340-7300)	1254
	01-02	<b>2230</b> (1970-2540)	<b>2170</b> (1870-2550)	<b>3860</b> (3180-4520)	<b>6460</b> (5140-8290)	<b>9110</b> (6940-11400)	1171
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	<b>1910</b> (1600-2340)	667
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	<b>2800</b> (2480-3110)	<b>4570</b> (4100-5020)	<b>6200</b> (5340-7300)	1254
	01-02	<b>2230</b> (1970-2540)	<b>2170</b> (1870-2550)	<b>3860</b> (3180-4520)	<b>6460</b> (5140-8290)	<b>9110</b> (6940-11400)	1171
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	<b>2210</b> (1860-2480)	<b>3270</b> (2880-3900)	<b>4620</b> (3630-6870)	575
	01-02	*	< LOD	<b>3100</b> (2410-4070)	<b>5270</b> (4070-7140)	<b>7410</b> (6020-9760)	517
Females	99-00	*	< LOD	<b>3370</b> (2990-3830)	<b>5270</b> (4780-6050)	<b>7070</b> (6150-9280)	679
	01-02	<b>2590</b> (2250-2980)	<b>2620</b> (2160-3000)	<b>4340</b> (3880-4860)	<b>6990</b> (5870-9040)	<b>9460</b> (7070-12300)	654
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	<b>2880</b> (2400-3390)	<b>4450</b> (3870-6010)	<b>6690</b> (5340-7990)	333
	01-02	*	< LOD	<b>3410</b> (2760-3860)	<b>5810</b> (4250-7670)	<b>8050</b> (5760-11800)	250
Non-Hispanic blacks	99-00	*	< LOD	<b>2780</b> (2480-3660)	<b>5080</b> (4310-6550)	<b>7550</b> (4900-11600)	226
	01-02	<b>2480</b> (2050-3000)	<b>2460</b> (2060-2970)	<b>4170</b> (3160-5560)	<b>7140</b> (5470-9920)	<b>9460</b> (7990-12000)	210
Non-Hispanic whites	99-00	*	< LOD	<b>2800</b> (2400-3150)	<b>4270</b> (3790-4980)	<b>5960</b> (4930-7390)	578
	01-02	<b>2270</b> (1930-2660)	<b>2200</b> (1840-2770)	<b>3860</b> (3090-4720)	<b>6460</b> (4890-8860)	<b>9120</b> (6630-12300)	632

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 83. 1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin (HpCDD) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean	Selected percentiles				Sample size
		(95% conf. interval)	(95% confidence interval)				
			50th	75th	90th	95th	
Total, age 20 and older	99-00	*	< LOD	61.9 (57.1-66.7)	92.0 (81.2-101)	119 (102-139)	1237
	01-02	39.0 (33.7-45.0)	40.2 (34.9-46.7)	68.7 (56.7-82.2)	115 (88.2-138)	147 (126-177)	1220
Age group							
12-19 years	99-00	*	< LOD	< LOD	< LOD	63.6 (<LOD-75.6)	657
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	61.9 (57.1-66.7)	92.0 (81.2-101)	119 (102-139)	1237
	01-02	39.0 (33.7-45.0)	40.2 (34.9-46.7)	68.7 (56.7-82.2)	115 (88.2-138)	147 (126-177)	1220
Gender							
(20 years and older)							
Males	99-00	*	< LOD	56.2 (<LOD-63.6)	75.5 (69.9-85.2)	95.0 (84.0-103)	572
	01-02	36.6 (31.7-42.3)	38.7 (33.3-42.6)	61.6 (49.7-75.0)	101 (75.6-131)	138 (103-169)	553
Females	99-00	*	< LOD	67.1 (59.7-73.6)	105 (94.8-122)	137 (120-169)	665
	01-02	41.2 (34.9-48.7)	43.6 (35.3-52.4)	76.0 (59.5-90.1)	123 (92.6-143)	157 (130-191)	667
Race/ethnicity							
(20 years and older)							
Mexican Americans	99-00	*	< LOD	66.8 (60.7-74.1)	102 (83.6-115)	135 (108-169)	330
	01-02	39.6 (35.7-43.9)	39.7 (33.6-47.4)	64.0 (55.8-74.7)	107 (82.4-128)	148 (111-171)	262
Non-Hispanic blacks	99-00	*	< LOD	62.2 (<LOD-75.1)	101 (81.8-114)	137 (106-187)	224
	01-02	43.7 (35.4-54.0)	42.0 (32.2-59.8)	80.6 (60.9-106)	134 (101-166)	166 (130-230)	218
Non-Hispanic whites	99-00	*	< LOD	62.2 (<LOD-67.1)	88.7 (74.0-102)	116 (97.0-134)	567
	01-02	39.3 (33.0-46.8)	40.5 (34.0-50.1)	70.9 (56.3-87.5)	117 (85.9-145)	147 (125-186)	657

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.



**Table 84. 1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin (HpCDD) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	<b>385</b> (354-418)	<b>610</b> (534-677)	<b>802</b> (681-936)	1237
	01-02	<b>252</b> (219-289)	<b>265</b> (232-303)	<b>440</b> (376-529)	<b>779</b> (591-989)	<b>1030</b> (840-1290)	1220
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	<b>287</b> (239-340)	657
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	<b>385</b> (354-418)	<b>610</b> (534-677)	<b>802</b> (681-936)	1237
	01-02	<b>252</b> (219-289)	<b>265</b> (232-303)	<b>440</b> (376-529)	<b>779</b> (591-989)	<b>1030</b> (840-1290)	1220
<b>Gender</b>							
(20 years and older)							
Males	99-00	*	< LOD	<b>363</b> (310-397)	<b>501</b> (446-578)	<b>642</b> (543-716)	572
	01-02	<b>243</b> (211-279)	<b>244</b> (213-291)	<b>422</b> (349-527)	<b>765</b> (536-976)	<b>983</b> (766-1260)	553
Females	99-00	*	< LOD	<b>414</b> (354-462)	<b>707</b> (597-867)	<b>945</b> (825-1100)	665
	01-02	<b>260</b> (221-306)	<b>281</b> (236-324)	<b>464</b> (386-551)	<b>782</b> (621-997)	<b>1140</b> (849-1330)	667
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	99-00	*	< LOD	<b>404</b> (364-472)	<b>646</b> (585-785)	<b>906</b> (677-1090)	330
	01-02	<b>254</b> (232-278)	<b>249</b> (229-286)	<b>403</b> (360-521)	<b>789</b> (643-929)	<b>988</b> (817-1240)	262
Non-Hispanic blacks	99-00	*	< LOD	<b>373</b> (297-428)	<b>592</b> (480-752)	<b>966</b> (610-1220)	224
	01-02	<b>258</b> (208-319)	<b>262</b> (180-339)	<b>469</b> (343-600)	<b>852</b> (578-1170)	<b>1160</b> (821-1660)	218
Non-Hispanic whites	99-00	*	< LOD	<b>391</b> (353-430)	<b>610</b> (511-679)	<b>758</b> (676-871)	567
	01-02	<b>255</b> (216-302)	<b>276</b> (228-328)	<b>442</b> (374-547)	<b>779</b> (551-1010)	<b>1020</b> (803-1290)	657

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 85. 1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin (HxCDD) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2001-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	01-02	*	< LOD	< LOD	<b>10.7</b> (<LOD-13.8)	<b>14.9</b> (11.7-20.0)	1239
<b>Age group</b>							
12-19 years	01-02	†	†	†	†	†	†
20 years and older	01-02	*	< LOD	< LOD	<b>10.7</b> (<LOD-13.8)	<b>14.9</b> (11.7-20.0)	1239
<b>Gender</b>							
(20 years and older)							
Males	01-02	*	< LOD	< LOD	<b>10.9</b> (<LOD-14.3)	<b>14.7</b> (11.4-16.5)	566
Females	01-02	*	< LOD	< LOD	<b>10.6</b> (<LOD-14.1)	<b>14.9</b> (11.1-23.0)	673
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	01-02	*	< LOD	< LOD	< LOD	<b>9.20</b> (<LOD-11.7)	263
Non-Hispanic blacks	01-02	*	< LOD	< LOD	<b>13.9</b> (<LOD-17.6)	<b>18.3</b> (13.9-23.0)	220
Non-Hispanic whites	01-02	*	< LOD	< LOD	<b>11.2</b> (<LOD-14.4)	<b>15.1</b> (12.0-20.5)	672

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 86. 1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin (HxCDD) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2001-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	01-02	*	< LOD	< LOD	<b>73.8</b> (54.3-90.7)	<b>105</b> (81.2-139)	1239
<b>Age group</b>							
12-19 years	01-02	†	†	†	†	†	†
20 years and older	01-02	*	< LOD	< LOD	<b>73.8</b> (54.3-90.7)	<b>105</b> (81.2-139)	1239
<b>Gender</b> (20 years and older)							
Males	01-02	*	< LOD	< LOD	<b>73.4</b> (52.6-90.7)	<b>105</b> (77.9-134)	566
Females	01-02	*	< LOD	< LOD	<b>73.8</b> (53.2-90.7)	<b>102</b> (78.0-152)	673
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	01-02	*	< LOD	< LOD	< LOD	<b>70.2</b> (48.0-118)	263
Non-Hispanic blacks	01-02	*	< LOD	< LOD	<b>82.1</b> (53.3-130)	<b>125</b> (75.7-184)	220
Non-Hispanic whites	01-02	*	< LOD	< LOD	<b>77.5</b> (53.2-97.1)	<b>105</b> (78.8-143)	672

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 87. 1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin (HxCDD) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	<b>36.1</b> (31.5-40.5)	<b>62.8</b> (53.6-69.1)	<b>75.6</b> (70.5-84.2)	1237
	01-02	<b>34.6</b> (29.6-40.6)	<b>39.2</b> (32.7-44.7)	<b>60.7</b> (50.3-74.2)	<b>95.2</b> (76.2-120)	<b>127</b> (99.4-153)	1234
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	<b>26.7</b> (20.2-29.6)	648
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	<b>36.1</b> (31.5-40.5)	<b>62.8</b> (53.6-69.1)	<b>75.6</b> (70.5-84.2)	1237
	01-02	<b>34.6</b> (29.6-40.6)	<b>39.2</b> (32.7-44.7)	<b>60.7</b> (50.3-74.2)	<b>95.2</b> (76.2-120)	<b>127</b> (99.4-153)	1234
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	<b>34.4</b> (27.2-40.5)	<b>59.2</b> (47.1-68.5)	<b>73.0</b> (64.4-81.9)	569
	01-02	<b>34.1</b> (28.3-41.1)	<b>38.8</b> (31.5-44.6)	<b>61.3</b> (50.0-79.5)	<b>94.7</b> (70.8-131)	<b>128</b> (88.5-181)	564
Females	99-00	*	< LOD	<b>37.9</b> (32.5-41.6)	<b>65.6</b> (55.1-70.5)	<b>82.8</b> (69.3-98.9)	668
	01-02	<b>35.1</b> (29.9-41.2)	<b>40.1</b> (32.4-46.3)	<b>59.8</b> (49.8-72.3)	<b>97.0</b> (77.1-114)	<b>126</b> (108-142)	670
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	<b>24.2</b> (<LOD-32.4)	<b>46.8</b> (38.1-56.1)	<b>59.5</b> (52.7-67.9)	332
	01-02	<b>18.3</b> (15.6-21.4)	<b>21.2</b> (19.4-25.0)	<b>31.9</b> (27.0-40.3)	<b>51.5</b> (40.3-69.9)	<b>67.9</b> (48.0-111)	260
Non-Hispanic blacks	99-00	*	< LOD	<b>35.1</b> (28.4-44.9)	<b>62.8</b> (48.0-79.2)	<b>84.9</b> (72.2-98.1)	223
	01-02	<b>38.9</b> (33.6-45.0)	<b>40.2</b> (33.5-47.3)	<b>63.2</b> (54.6-76.9)	<b>93.9</b> (78.5-132)	<b>133</b> (92.6-185)	219
Non-Hispanic whites	99-00	*	< LOD	<b>38.2</b> (34.4-42.0)	<b>64.4</b> (54.3-69.3)	<b>77.7</b> (69.9-84.9)	567
	01-02	<b>37.8</b> (31.5-45.4)	<b>42.6</b> (33.9-51.1)	<b>65.0</b> (52.3-82.2)	<b>99.6</b> (78.4-130)	<b>130</b> (103-165)	671

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 88. 1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin (HxCDD) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	<b>232</b> (196-268)	<b>403</b> (349-458)	<b>520</b> (458-607)	1237
	01-02	<b>224</b> (192-261)	<b>246</b> (219-287)	<b>410</b> (347-498)	<b>663</b> (549-785)	<b>870</b> (696-1100)	1234
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	<b>122</b> (93.2-155)	648
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	<b>232</b> (196-268)	<b>403</b> (349-458)	<b>520</b> (458-607)	1237
	01-02	<b>224</b> (192-261)	<b>246</b> (219-287)	<b>410</b> (347-498)	<b>663</b> (549-785)	<b>870</b> (696-1100)	1234
<b>Gender</b>							
(20 years and older)							
Males	99-00	*	< LOD	<b>211</b> (170-255)	<b>380</b> (297-440)	<b>460</b> (398-571)	569
	01-02	<b>226</b> (190-270)	<b>262</b> (223-301)	<b>425</b> (347-540)	<b>677</b> (547-794)	<b>883</b> (666-1180)	564
Females	99-00	*	< LOD	<b>246</b> (196-298)	<b>424</b> (350-521)	<b>579</b> (492-672)	668
	01-02	<b>222</b> (190-260)	<b>237</b> (207-281)	<b>397</b> (338-474)	<b>643</b> (526-771)	<b>863</b> (720-1060)	670
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	99-00	*	< LOD	<b>154</b> (102-213)	<b>307</b> (272-359)	<b>392</b> (357-445)	332
	01-02	<b>117</b> (99.4-139)	<b>128</b> (107-157)	<b>233</b> (198-270)	<b>401</b> (278-524)	<b>524</b> (384-731)	260
Non-Hispanic blacks	99-00	*	< LOD	<b>212</b> (167-275)	<b>389</b> (302-477)	<b>522</b> (399-627)	223
	01-02	<b>229</b> (199-264)	<b>226</b> (190-284)	<b>371</b> (333-477)	<b>643</b> (480-799)	<b>799</b> (596-1260)	219
Non-Hispanic whites	99-00	*	< LOD	<b>251</b> (207-293)	<b>421</b> (353-481)	<b>526</b> (472-617)	567
	01-02	<b>246</b> (206-293)	<b>272</b> (233-325)	<b>440</b> (365-552)	<b>679</b> (549-870)	<b>897</b> (718-1150)	671

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.



**Table 89. 1,2,3,7,8,9-Hexachlorodibenzo-*p*-dioxin (HxCDD) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1228
	01-02	*	< LOD	< LOD	12.4 (10.4-15.1)	16.9 (14.3-20.0)	1238
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	642
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1228
	01-02	*	< LOD	< LOD	12.4 (10.4-15.1)	16.9 (14.3-20.0)	1238
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	565
	01-02	*	< LOD	< LOD	12.0 (<LOD-14.5)	14.8 (12.9-18.0)	567
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	663
	01-02	*	< LOD	< LOD	12.9 (10.7-16.7)	18.3 (15.3-20.9)	671
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	328
	01-02	*	< LOD	< LOD	9.40 (<LOD-11.2)	12.1 (<LOD-20.0)	262
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	223
	01-02	*	< LOD	< LOD	14.4 (11.2-20.0)	19.9 (14.6-23.9)	220
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	562
	01-02	*	< LOD	< LOD	12.6 (9.90-15.9)	17.2 (14.7-20.6)	672

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 90. 1,2,3,7,8,9-Hexachlorodibenzo-*p*-dioxin (HxCDD) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1228
	01-02	*	< LOD	< LOD	86.5 (68.8-108)	121 (99.5-146)	1238
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	642
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1228
	01-02	*	< LOD	< LOD	86.5 (68.8-108)	121 (99.5-146)	1238
<b>Gender</b>							
(20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	565
	01-02	*	< LOD	< LOD	84.1 (62.7-104)	108 (90.6-142)	567
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	663
	01-02	*	< LOD	< LOD	89.7 (67.9-121)	123 (102-150)	671
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	328
	01-02	*	< LOD	< LOD	74.7 (50.5-104)	104 (74.7-167)	262
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	223
	01-02	*	< LOD	< LOD	92.6 (62.8-126)	123 (82.6-169)	220
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	562
	01-02	*	< LOD	< LOD	88.1 (67.9-119)	124 (96.6-152)	672

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 91. 1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin (PeCDD) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1256
	01-02	*	< LOD	< LOD	11.2 (9.30-13.3)	15.8 (13.3-19.8)	1236
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	659
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1256
	01-02	*	< LOD	< LOD	11.2 (9.30-13.3)	15.8 (13.3-19.8)	1236
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	578
	01-02	*	< LOD	< LOD	10.5 (9.10-13.3)	14.3 (11.7-19.4)	564
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	678
	01-02	*	< LOD	6.10 (<LOD-7.80)	11.6 (9.30-13.9)	16.4 (13.7-20.8)	672
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	338
	01-02	*	< LOD	< LOD	< LOD	8.70 (<LOD-12.7)	262
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	225
	01-02	*	< LOD	7.70 (<LOD-9.30)	13.8 (9.60-18.4)	18.4 (14.2-24.0)	218
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	576
	01-02	*	< LOD	< LOD	11.6 (9.40-14.1)	16.7 (13.6-20.2)	672

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 92. 1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin (PeCDD) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1256
	01-02	*	< LOD	< LOD	77.8 (62.8-95.1)	117 (90.3-133)	1236
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	659
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1256
	01-02	*	< LOD	< LOD	77.8 (62.8-95.1)	117 (90.3-133)	1236
<b>Gender</b>							
(20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	578
	01-02	*	< LOD	< LOD	76.1 (54.7-93.7)	107 (83.5-133)	564
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	678
	01-02	*	< LOD	37.8 (25.0-50.2)	80.1 (62.9-107)	121 (85.7-167)	672
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	338
	01-02	*	< LOD	< LOD	< LOD	66.0 (43.3-111)	262
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	225
	01-02	*	< LOD	43.0 (27.0-53.8)	81.9 (58.2-117)	123 (81.9-169)	218
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	576
	01-02	*	< LOD	< LOD	80.8 (61.6-107)	119 (88.6-142)	672

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 93. 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1240
	01-02	*	< LOD	< LOD	< LOD	< LOD	1228
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	658
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1240
	01-02	*	< LOD	< LOD	< LOD	< LOD	1228
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	572
	01-02	*	< LOD	< LOD	< LOD	< LOD	559
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	668
	01-02	*	< LOD	< LOD	< LOD	6.40 (<LOD-9.10)	669
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	336
	01-02	*	< LOD	< LOD	< LOD	< LOD	262
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	222
	01-02	*	< LOD	< LOD	< LOD	7.40 (<LOD-10.0)	217
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	567
	01-02	*	< LOD	< LOD	< LOD	< LOD	665

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.



**Table 94. 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1240
	01-02	*	< LOD	< LOD	< LOD	< LOD	1228
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	658
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1240
	01-02	*	< LOD	< LOD	< LOD	< LOD	1228
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	572
	01-02	*	< LOD	< LOD	< LOD	< LOD	559
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	668
	01-02	*	< LOD	< LOD	< LOD	50.7 (29.2-74.3)	669
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	336
	01-02	*	< LOD	< LOD	< LOD	< LOD	262
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	222
	01-02	*	< LOD	< LOD	< LOD	52.1 (27.4-72.0)	217
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	567
	01-02	*	< LOD	< LOD	< LOD	< LOD	665

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 95. 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1232
	01-02	*	< LOD	< LOD	< LOD	< LOD	1202
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	652
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1232
	01-02	*	< LOD	< LOD	< LOD	< LOD	1202
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	569
	01-02	*	< LOD	< LOD	< LOD	< LOD	541
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	663
	01-02	*	< LOD	< LOD	< LOD	< LOD	661
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	329
	01-02	*	< LOD	< LOD	< LOD	< LOD	257
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	224
	01-02	*	< LOD	< LOD	< LOD	< LOD	212
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	568
	01-02	*	< LOD	< LOD	< LOD	< LOD	653

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 96. 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1232
	01-02	*	< LOD	< LOD	< LOD	< LOD	1202
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	652
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1232
	01-02	*	< LOD	< LOD	< LOD	< LOD	1202
<b>Gender</b>							
(20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	569
	01-02	*	< LOD	< LOD	< LOD	< LOD	541
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	663
	01-02	*	< LOD	< LOD	< LOD	< LOD	661
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	329
	01-02	*	< LOD	< LOD	< LOD	< LOD	257
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	224
	01-02	*	< LOD	< LOD	< LOD	< LOD	212
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	568
	01-02	*	< LOD	< LOD	< LOD	< LOD	653

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 97. 1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	14.2 (<LOD-17.5)	18.4 (15.0-23.8)	1109
	01-02	9.64 (8.53-10.9)	10.3 (8.80-11.7)	14.5 (12.7-16.6)	21.3 (18.0-25.5)	27.1 (22.5-32.0)	1219
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	17.7 (16.2-20.9)	24.0 (20.9-28.1)	600
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	14.2 (<LOD-17.5)	18.4 (15.0-23.8)	1109
	01-02	9.64 (8.53-10.9)	10.3 (8.80-11.7)	14.5 (12.7-16.6)	21.3 (18.0-25.5)	27.1 (22.5-32.0)	1219
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	15.9 (<LOD-20.0)	19.9 (16.4-26.9)	508
	01-02	10.1 (8.74-11.6)	10.9 (9.00-12.5)	15.2 (12.9-17.2)	20.8 (17.2-27.8)	28.9 (22.0-34.8)	557
Females	99-00	*	< LOD	< LOD	< LOD	17.0 (14.0-25.2)	601
	01-02	9.28 (8.20-10.5)	9.30 (8.10-11.0)	14.1 (12.3-15.9)	21.0 (17.4-25.5)	26.5 (22.3-31.9)	662
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	17.3 (<LOD-23.1)	299
	01-02	7.73 (7.19-8.31)	8.20 (7.80-8.60)	11.1 (10.6-12.5)	16.5 (14.5-19.6)	20.2 (17.2-26.8)	260
Non-Hispanic blacks	99-00	*	< LOD	< LOD	22.4 (14.0-28.3)	28.2 (25.3-29.8)	202
	01-02	12.3 (10.6-14.4)	12.8 (10.9-15.2)	17.2 (15.4-21.0)	25.5 (22.4-31.2)	32.1 (25.7-37.6)	214
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	16.8 (14.2-18.5)	503
	01-02	9.50 (8.30-10.9)	10.0 (8.20-11.8)	14.4 (12.6-16.2)	20.5 (16.9-25.3)	25.5 (20.5-31.7)	665

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 98. 1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	<b>85.7</b> (74.7-97.7)	<b>108</b> (93.6-127)	1109
	01-02	<b>62.2</b> (55.4-69.9)	<b>64.4</b> (58.0-71.6)	<b>94.1</b> (82.3-110)	<b>134</b> (119-165)	<b>181</b> (147-206)	1219
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	<b>79.3</b> (69.5-84.2)	<b>99.0</b> (83.4-120)	600
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	<b>85.7</b> (74.7-97.7)	<b>108</b> (93.6-127)	1109
	01-02	<b>62.2</b> (55.4-69.9)	<b>64.4</b> (58.0-71.6)	<b>94.1</b> (82.3-110)	<b>134</b> (119-165)	<b>181</b> (147-206)	1219
<b>Gender</b>							
(20 years and older)							
Males	99-00	*	< LOD	< LOD	<b>89.0</b> (74.7-111)	<b>111</b> (93.6-138)	508
	01-02	<b>66.3</b> (58.2-75.6)	<b>70.0</b> (59.8-81.8)	<b>99.3</b> (85.5-120)	<b>143</b> (120-181)	<b>181</b> (146-237)	557
Females	99-00	*	< LOD	< LOD	< LOD	<b>101</b> (85.7-149)	601
	01-02	<b>58.8</b> (52.0-66.4)	<b>60.2</b> (53.5-67.6)	<b>89.1</b> (74.7-107)	<b>130</b> (108-164)	<b>169</b> (131-225)	662
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	<b>112</b> (81.1-121)	299
	01-02	<b>49.5</b> (46.0-53.4)	<b>50.2</b> (45.7-57.2)	<b>76.5</b> (67.1-82.1)	<b>97.2</b> (90.9-124)	<b>133</b> (94.8-202)	260
Non-Hispanic blacks	99-00	*	< LOD	< LOD	<b>124</b> (92.0-153)	<b>157</b> (114-214)	202
	01-02	<b>72.6</b> (61.9-85.2)	<b>70.5</b> (62.4-85.2)	<b>107</b> (91.5-128)	<b>146</b> (131-177)	<b>192</b> (154-259)	214
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	<b>97.8</b> (89.3-105)	503
	01-02	<b>61.8</b> (54.3-70.4)	<b>64.5</b> (57.4-72.2)	<b>94.3</b> (78.1-112)	<b>133</b> (114-166)	<b>180</b> (137-222)	665

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.



**Table 99. 1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2001-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	01-02	*	< LOD	< LOD	< LOD	< LOD	1224
<b>Age group</b>							
12-19 years	01-02	†	†	†	†	†	†
20 years and older	01-02	*	< LOD	< LOD	< LOD	< LOD	1224
<b>Gender</b>							
(20 years and older)							
Males	01-02	*	< LOD	< LOD	< LOD	< LOD	558
Females	01-02	*	< LOD	< LOD	< LOD	< LOD	666
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	01-02	*	< LOD	< LOD	< LOD	< LOD	262
Non-Hispanic blacks	01-02	*	< LOD	< LOD	< LOD	< LOD	217
Non-Hispanic whites	01-02	*	< LOD	< LOD	< LOD	< LOD	661

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 100. 1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2001-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	01-02	*	< LOD	< LOD	< LOD	< LOD	1224
<b>Age group</b>							
12-19 years	01-02	†	†	†	†	†	†
20 years and older	01-02	*	< LOD	< LOD	< LOD	< LOD	1224
<b>Gender</b>							
(20 years and older)							
Males	01-02	*	< LOD	< LOD	< LOD	< LOD	558
Females	01-02	*	< LOD	< LOD	< LOD	< LOD	666
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	01-02	*	< LOD	< LOD	< LOD	< LOD	262
Non-Hispanic blacks	01-02	*	< LOD	< LOD	< LOD	< LOD	217
Non-Hispanic whites	01-02	*	< LOD	< LOD	< LOD	< LOD	661

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 101. 1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1233
	01-02	*	< LOD	8.00 (6.90-9.30)	12.1 (9.40-14.9)	15.4 (12.9-18.6)	1223
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	657
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1233
	01-02	*	< LOD	8.00 (6.90-9.30)	12.1 (9.40-14.9)	15.4 (12.9-18.6)	1223
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	567
	01-02	*	< LOD	8.20 (7.10-9.70)	12.6 (9.50-15.9)	15.9 (12.2-20.9)	562
Females	99-00	*	< LOD	< LOD	< LOD	13.0 (<LOD-17.1)	666
	01-02	*	< LOD	7.90 (6.60-9.00)	11.7 (9.40-13.8)	14.1 (12.1-18.6)	661
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	333
	01-02	*	< LOD	< LOD	7.20 (<LOD-8.00)	8.00 (6.90-10.7)	261
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	14.5 (<LOD-18.1)	221
	01-02	*	< LOD	8.90 (7.70-10.1)	13.6 (11.1-17.1)	18.6 (14.6-22.6)	214
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	563
	01-02	*	< LOD	8.20 (7.10-10.2)	12.5 (9.90-15.5)	15.9 (13.1-19.0)	664

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 102. 1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1233
	01-02	*	< LOD	<b>54.0</b> (46.5-63.6)	<b>82.3</b> (65.5-104)	<b>108</b> (88.0-138)	1223
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	657
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1233
	01-02	*	< LOD	<b>54.0</b> (46.5-63.6)	<b>82.3</b> (65.5-104)	<b>108</b> (88.0-138)	1223
<b>Gender</b>							
(20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	567
	01-02	*	< LOD	<b>56.9</b> (48.6-71.4)	<b>90.1</b> (71.1-108)	<b>108</b> (87.4-144)	562
Females	99-00	*	< LOD	< LOD	< LOD	<b>86.1</b> (72.5-105)	666
	01-02	*	< LOD	<b>51.6</b> (43.7-59.6)	<b>76.1</b> (62.6-97.0)	<b>104</b> (80.1-139)	661
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	333
	01-02	*	< LOD	< LOD	<b>48.4</b> (42.2-56.3)	<b>65.3</b> (48.6-79.4)	261
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	<b>96.5</b> (75.9-120)	221
	01-02	*	< LOD	<b>52.7</b> (45.0-62.7)	<b>85.2</b> (63.7-108)	<b>122</b> (85.2-147)	214
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	563
	01-02	*	< LOD	<b>56.0</b> (48.5-66.1)	<b>84.2</b> (64.5-115)	<b>112</b> (88.6-142)	664

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 103. 1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1242
	01-02	*	< LOD	7.10 (<LOD-8.20)	10.3 (9.00-13.1)	14.0 (11.0-17.1)	1236
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	656
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1242
	01-02	*	< LOD	7.10 (<LOD-8.20)	10.3 (9.00-13.1)	14.0 (11.0-17.1)	1236
<b>Gender</b>							
(20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	573
	01-02	*	< LOD	7.10 (<LOD-8.50)	11.3 (8.50-13.8)	14.8 (11.3-18.7)	566
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	669
	01-02	*	< LOD	7.00 (6.10-7.90)	9.90 (9.20-11.2)	13.1 (10.5-15.6)	670
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	332
	01-02	*	< LOD	< LOD	< LOD	6.80 (<LOD-11.1)	262
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	225
	01-02	*	< LOD	7.60 (6.10-9.10)	11.9 (10.0-14.1)	15.6 (12.3-21.0)	219
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	569
	01-02	*	< LOD	7.30 (6.20-9.00)	10.7 (9.00-14.0)	14.8 (11.6-17.2)	670

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.



**Table 104. 1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1242
	01-02	*	< LOD	<b>46.0</b> (38.6-56.5)	<b>70.2</b> (58.3-90.2)	<b>101</b> (77.6-120)	1236
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	656
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1242
	01-02	*	< LOD	<b>46.0</b> (38.6-56.5)	<b>70.2</b> (58.3-90.2)	<b>101</b> (77.6-120)	1236
<b>Gender</b>							
(20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	573
	01-02	*	< LOD	<b>47.6</b> (38.3-60.5)	<b>72.3</b> (57.5-105)	<b>104</b> (73.5-133)	566
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	669
	01-02	*	< LOD	<b>45.0</b> (37.0-54.3)	<b>66.2</b> (58.3-79.1)	<b>90.2</b> (71.9-115)	670
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	332
	01-02	*	< LOD	< LOD	< LOD	<b>52.7</b> (41.2-65.9)	262
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	225
	01-02	*	< LOD	<b>44.4</b> (37.2-57.3)	<b>71.5</b> (59.8-90.9)	<b>107</b> (70.7-142)	219
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	569
	01-02	*	< LOD	<b>49.6</b> (41.9-57.9)	<b>72.8</b> (58.4-102)	<b>103</b> (82.6-121)	670

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 105. 1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1230
	01-02	*	< LOD	< LOD	< LOD	< LOD	1223
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	645
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1230
	01-02	*	< LOD	< LOD	< LOD	< LOD	1223
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	564
	01-02	*	< LOD	< LOD	< LOD	< LOD	559
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	666
	01-02	*	< LOD	< LOD	< LOD	< LOD	664
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	332
	01-02	*	< LOD	< LOD	< LOD	< LOD	261
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	221
	01-02	*	< LOD	< LOD	< LOD	< LOD	216
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	560
	01-02	*	< LOD	< LOD	< LOD	< LOD	665

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 106. 1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1230
	01-02	*	< LOD	< LOD	< LOD	< LOD	1223
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	645
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1230
	01-02	*	< LOD	< LOD	< LOD	< LOD	1223
<b>Gender</b>							
(20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	564
	01-02	*	< LOD	< LOD	< LOD	< LOD	559
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	666
	01-02	*	< LOD	< LOD	< LOD	< LOD	664
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	332
	01-02	*	< LOD	< LOD	< LOD	< LOD	261
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	221
	01-02	*	< LOD	< LOD	< LOD	< LOD	216
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	560
	01-02	*	< LOD	< LOD	< LOD	< LOD	665

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 107. 1,2,3,7,8-Pentachlorodibenzofuran (PeCDF) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1259
	01-02	*	< LOD	< LOD	< LOD	< LOD	1235
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	663
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1259
	01-02	*	< LOD	< LOD	< LOD	< LOD	1235
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	578
	01-02	*	< LOD	< LOD	< LOD	< LOD	565
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	681
	01-02	*	< LOD	< LOD	< LOD	< LOD	670
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	339
	01-02	*	< LOD	< LOD	< LOD	< LOD	263
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	226
	01-02	*	< LOD	< LOD	< LOD	< LOD	217
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	576
	01-02	*	< LOD	< LOD	< LOD	< LOD	670

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 108. 1,2,3,7,8-Pentachlorodibenzofuran (PeCDF) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1259
	01-02	*	< LOD	< LOD	< LOD	< LOD	1235
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	663
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1259
	01-02	*	< LOD	< LOD	< LOD	< LOD	1235
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	578
	01-02	*	< LOD	< LOD	< LOD	< LOD	565
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	681
	01-02	*	< LOD	< LOD	< LOD	< LOD	670
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	339
	01-02	*	< LOD	< LOD	< LOD	< LOD	263
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	226
	01-02	*	< LOD	< LOD	< LOD	< LOD	217
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	576
	01-02	*	< LOD	< LOD	< LOD	< LOD	670

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 109. 2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1232
	01-02	*	< LOD	< LOD	< LOD	< LOD	1230
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	652
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1232
	01-02	*	< LOD	< LOD	< LOD	< LOD	1230
<b>Gender (20 years and older)</b>							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	566
	01-02	*	< LOD	< LOD	< LOD	< LOD	565
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	666
	01-02	*	< LOD	< LOD	< LOD	< LOD	665
<b>Race/ethnicity (20 years and older)</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	326
	01-02	*	< LOD	< LOD	< LOD	< LOD	260
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	225
	01-02	*	< LOD	< LOD	< LOD	< LOD	218
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	564
	01-02	*	< LOD	< LOD	< LOD	< LOD	671

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 110. 2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1232
	01-02	*	< LOD	< LOD	< LOD	< LOD	1230
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	652
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1232
	01-02	*	< LOD	< LOD	< LOD	< LOD	1230
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	566
	01-02	*	< LOD	< LOD	< LOD	< LOD	565
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	666
	01-02	*	< LOD	< LOD	< LOD	< LOD	665
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	326
	01-02	*	< LOD	< LOD	< LOD	< LOD	260
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	225
	01-02	*	< LOD	< LOD	< LOD	< LOD	218
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	564
	01-02	*	< LOD	< LOD	< LOD	< LOD	671

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.



**Table 111. 2,3,4,7,8-Pentachlorodibenzofuran (PeCDF) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	<b>16.1</b> (13.9-17.2)	1239
	01-02	*	< LOD	<b>9.10</b> (7.40-11.0)	<b>14.3</b> (12.3-16.2)	<b>18.0</b> (16.1-21.1)	1230
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	656
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	<b>16.1</b> (13.9-17.2)	1239
	01-02	*	< LOD	<b>9.10</b> (7.40-11.0)	<b>14.3</b> (12.3-16.2)	<b>18.0</b> (16.1-21.1)	1230
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	<b>14.1</b> (12.9-15.7)	569
	01-02	*	< LOD	<b>9.30</b> (7.30-11.6)	<b>14.1</b> (11.6-16.7)	<b>16.7</b> (13.9-21.4)	560
Females	99-00	*	< LOD	< LOD	<b>13.7</b> (<LOD-16.1)	<b>17.1</b> (15.5-19.3)	670
	01-02	*	< LOD	<b>9.10</b> (7.50-10.7)	<b>14.3</b> (13.0-16.1)	<b>18.5</b> (16.4-21.2)	670
<b>Race/ethnicity</b> (20 years and older)							
<b>Mexican Americans</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	339
	01-02	*	< LOD	< LOD	<b>7.80</b> (6.00-9.60)	<b>9.80</b> (7.80-12.5)	264
Non-Hispanic blacks	99-00	*	< LOD	< LOD	<b>12.9</b> (<LOD-15.0)	<b>16.6</b> (13.7-21.0)	220
	01-02	*	< LOD	<b>8.30</b> (6.80-9.30)	<b>13.9</b> (11.7-16.4)	<b>18.9</b> (15.1-23.0)	216
Non-Hispanic whites	99-00	*	< LOD	< LOD	<b>12.8</b> (<LOD-14.1)	<b>16.1</b> (14.1-17.5)	564
	01-02	*	<b>5.80</b> (<LOD-6.80)	<b>10.3</b> (8.10-11.9)	<b>15.5</b> (13.0-17.6)	<b>18.4</b> (16.5-22.2)	665

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 112. 2,3,4,7,8-Pentachlorodibenzofuran (PeCDF) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	<b>107</b> (98.3-125)	1239
	01-02	*	< LOD	<b>60.8</b> (51.3-70.5)	<b>98.5</b> (83.4-114)	<b>134</b> (113-152)	1230
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	656
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	<b>107</b> (98.3-125)	1239
	01-02	*	< LOD	<b>60.8</b> (51.3-70.5)	<b>98.5</b> (83.4-114)	<b>134</b> (113-152)	1230
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	<b>98.2</b> (80.7-109)	569
	01-02	*	< LOD	<b>61.7</b> (49.3-76.6)	<b>98.4</b> (76.6-134)	<b>135</b> (105-160)	560
Females	99-00	*	< LOD	< LOD	<b>93.5</b> (79.1-104)	<b>115</b> (103-129)	670
	01-02	*	< LOD	<b>59.7</b> (52.0-67.6)	<b>99.6</b> (90.5-105)	<b>126</b> (107-146)	670
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	339
	01-02	*	< LOD	< LOD	<b>55.8</b> (48.7-69.7)	<b>76.3</b> (61.9-92.4)	264
Non-Hispanic blacks	99-00	*	< LOD	< LOD	<b>79.4</b> (68.3-95.6)	<b>107</b> (86.9-143)	220
	01-02	*	< LOD	<b>50.0</b> (41.3-60.4)	<b>89.5</b> (72.3-107)	<b>121</b> (92.0-154)	216
Non-Hispanic whites	99-00	*	< LOD	< LOD	<b>88.8</b> (78.2-97.2)	<b>109</b> (98.2-128)	564
	01-02	*	<b>37.3</b> (30.1-44.1)	<b>65.4</b> (52.9-78.2)	<b>104</b> (90.7-118)	<b>135</b> (118-154)	665

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 113. 2,3,7,8-Tetrachlorodibenzofuran (TCDF) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1243
	01-02	*	< LOD	< LOD	< LOD	< LOD	1229
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	660
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1243
	01-02	*	< LOD	< LOD	< LOD	< LOD	1229
<b>Gender (20 years and older)</b>							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	574
	01-02	*	< LOD	< LOD	< LOD	< LOD	558
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	669
	01-02	*	< LOD	< LOD	< LOD	< LOD	671
<b>Race/ethnicity (20 years and older)</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	335
	01-02	*	< LOD	< LOD	< LOD	< LOD	262
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	226
	01-02	*	< LOD	< LOD	< LOD	< LOD	217
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	564
	01-02	*	< LOD	< LOD	< LOD	< LOD	667

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 114. 2,3,7,8-Tetrachlorodibenzofuran (TCDF) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1243
	01-02	*	< LOD	< LOD	< LOD	< LOD	1229
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	660
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1243
	01-02	*	< LOD	< LOD	< LOD	< LOD	1229
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	574
	01-02	*	< LOD	< LOD	< LOD	< LOD	558
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	669
	01-02	*	< LOD	< LOD	< LOD	< LOD	671
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	335
	01-02	*	< LOD	< LOD	< LOD	< LOD	262
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	226
	01-02	*	< LOD	< LOD	< LOD	< LOD	217
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	564
	01-02	*	< LOD	< LOD	< LOD	< LOD	667

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 115. 2,4,4'-Trichlorobiphenyl (PCB 28) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of lipid or parts per billion on a lipid-weight basis) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2000.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1849
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	647
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1202
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	886
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	963
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	618
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	392
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	687

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

**Table 116. 2,4,4'-Trichlorobiphenyl (PCB 28) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of serum or parts per billion) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2000.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1849
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	647
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1202
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	886
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	963
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	618
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	392
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	687

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

**Table 117. 2,3',4,4'-Tetrachlorobiphenyl (PCB 66) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of lipid or parts per billion on a lipid-weight basis) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1931
	01-02	*	< LOD	< LOD	< LOD	< LOD	2250
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	671
	01-02	*	< LOD	< LOD	< LOD	< LOD	724
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1260
	01-02	*	< LOD	< LOD	< LOD	< LOD	1526
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	919
	01-02	*	< LOD	< LOD	< LOD	< LOD	1047
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	1012
	01-02	*	< LOD	< LOD	< LOD	< LOD	1203
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	636
	01-02	*	< LOD	< LOD	< LOD	< LOD	548
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	414
	01-02	*	< LOD	< LOD	< LOD	< LOD	495
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	723
	01-02	*	< LOD	< LOD	< LOD	< LOD	1047

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.



**Table 118. 2,3',4,4'-Tetrachlorobiphenyl (PCB 66) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of serum or parts per billion) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1931
	01-02	*	< LOD	< LOD	< LOD	< LOD	2250
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	671
	01-02	*	< LOD	< LOD	< LOD	< LOD	724
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1260
	01-02	*	< LOD	< LOD	< LOD	< LOD	1526
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	919
	01-02	*	< LOD	< LOD	< LOD	< LOD	1047
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	1012
	01-02	*	< LOD	< LOD	< LOD	< LOD	1203
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	636
	01-02	*	< LOD	< LOD	< LOD	< LOD	548
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	414
	01-02	*	< LOD	< LOD	< LOD	< LOD	495
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	723
	01-02	*	< LOD	< LOD	< LOD	< LOD	1047

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

**Table 119. 2,4,4',5-Tetrachlorobiphenyl (PCB 74) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of lipid or parts per billion on a lipid-weight basis) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	< LOD	<b>20.7</b> (17.8-23.4)	<b>29.0</b> (24.5-32.3)	1924
	01-02	*	< LOD	<b>13.1</b> (11.0-15.7)	<b>23.3</b> (20.1-27.4)	<b>32.6</b> (26.9-38.7)	2307
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	671
	01-02	*	< LOD	< LOD	< LOD	< LOD	758
20 years and older	99-00	*	< LOD	<b>12.6</b> (<LOD-14.4)	<b>22.3</b> (19.5-25.6)	<b>30.0</b> (26.2-35.8)	1253
	01-02	*	< LOD	<b>14.6</b> (12.4-17.1)	<b>25.2</b> (21.4-28.9)	<b>34.8</b> (28.5-41.1)	1549
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	<b>15.3</b> (12.9-17.5)	<b>21.5</b> (18.3-24.4)	915
	01-02	*	< LOD	<b>10.5</b> (<LOD-12.1)	<b>20.2</b> (15.1-24.9)	<b>28.5</b> (20.8-38.2)	1075
Females	99-00	*	< LOD	<b>13.9</b> (<LOD-16.3)	<b>24.5</b> (21.9-28.5)	<b>31.6</b> (28.8-40.3)	1009
	01-02	*	< LOD	<b>15.7</b> (13.5-18.6)	<b>26.1</b> (23.1-29.3)	<b>35.9</b> (31.4-41.4)	1232
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	<b>15.8</b> (12.8-18.2)	636
	01-02	*	< LOD	< LOD	<b>13.0</b> (<LOD-18.1)	<b>19.6</b> (16.2-23.0)	567
Non-Hispanic blacks	99-00	*	< LOD	< LOD	<b>29.0</b> (18.6-38.4)	<b>43.5</b> (35.4-64.0)	411
	01-02	*	< LOD	<b>12.0</b> (<LOD-14.2)	<b>21.7</b> (16.4-26.9)	<b>31.5</b> (24.5-41.0)	515
Non-Hispanic whites	99-00	*	< LOD	< LOD	<b>21.6</b> (18.9-24.0)	<b>29.0</b> (24.1-32.0)	719
	01-02	*	< LOD	<b>14.6</b> (12.2-17.3)	<b>25.7</b> (21.3-30.1)	<b>35.5</b> (29.0-42.5)	1061

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

**Table 120. 2,4,4',5-Tetrachlorobiphenyl (PCB 74) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of serum or parts per billion) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	< LOD	.139 (.120-.151)	.183 (.162-.218)	1924
	01-02	*	< LOD	.084 (.073-.099)	.150 (.134-.174)	.212 (.181-.263)	2307
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	671
	01-02	*	< LOD	< LOD	< LOD	< LOD	758
20 years and older	99-00	*	< LOD	.084 (.072-.096)	.148 (.137-.158)	.203 (.174-.232)	1253
	01-02	*	< LOD	.094 (.081-.110)	.166 (.140-.192)	.226 (.196-.279)	1549
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	.098 (.088-.118)	.151 (.128-.168)	915
	01-02	*	< LOD	.069 (.057-.078)	.131 (.101-.171)	.189 (.138-.241)	1075
Females	99-00	*	< LOD	.096 (.077-.109)	.158 (.143-.184)	.223 (.186-.254)	1009
	01-02	*	< LOD	.101 (.088-.112)	.168 (.149-.190)	.236 (.205-.285)	1232
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	.111 (.083-.126)	636
	01-02	*	< LOD	< LOD	.087 (.067-.123)	.144 (.107-.157)	567
Non-Hispanic blacks	99-00	*	< LOD	< LOD	.169 (.109-.246)	.277 (.218-.418)	411
	01-02	*	< LOD	.070 (.058-.083)	.131 (.104-.166)	.192 (.152-.251)	515
Non-Hispanic whites	99-00	*	< LOD	< LOD	.145 (.126-.157)	.185 (.163-.212)	719
	01-02	*	< LOD	.096 (.078-.111)	.167 (.139-.196)	.229 (.194-.282)	1061

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

**Table 121. 3,4,4',5-Tetrachlorobiphenyl (PCB 81) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1232
	01-02	*	< LOD	< LOD	< LOD	< LOD	1215
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	651
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1232
	01-02	*	< LOD	< LOD	< LOD	< LOD	1215
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	566
	01-02	*	< LOD	< LOD	< LOD	< LOD	554
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	666
	01-02	*	< LOD	< LOD	< LOD	< LOD	661
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	333
	01-02	*	< LOD	< LOD	< LOD	< LOD	259
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	225
	01-02	*	< LOD	< LOD	< LOD	< LOD	218
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	557
	01-02	*	< LOD	< LOD	< LOD	< LOD	657

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 122. 3,4,4',5-Tetrachlorobiphenyl (PCB 81) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1232
	01-02	*	< LOD	< LOD	< LOD	< LOD	1215
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	651
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1232
	01-02	*	< LOD	< LOD	< LOD	< LOD	1215
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	566
	01-02	*	< LOD	< LOD	< LOD	< LOD	554
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	666
	01-02	*	< LOD	< LOD	< LOD	< LOD	661
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	333
	01-02	*	< LOD	< LOD	< LOD	< LOD	259
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	225
	01-02	*	< LOD	< LOD	< LOD	< LOD	218
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	557
	01-02	*	< LOD	< LOD	< LOD	< LOD	657

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 123. 2,3,3',4,4'-Pentachlorobiphenyl (PCB 105) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of lipid or parts per billion on a lipid-weight basis) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1915
	01-02	*	< LOD	< LOD	< LOD	< LOD	2307
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	665
	01-02	*	< LOD	< LOD	< LOD	< LOD	758
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1250
	01-02	*	< LOD	< LOD	< LOD	< LOD	1549
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	913
	01-02	*	< LOD	< LOD	< LOD	< LOD	1075
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	1002
	01-02	*	< LOD	< LOD	< LOD	< LOD	1232
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	635
	01-02	*	< LOD	< LOD	< LOD	< LOD	567
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	12.8 (<LOD-18.0)	409
	01-02	*	< LOD	< LOD	< LOD	< LOD	515
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	714
	01-02	*	< LOD	< LOD	< LOD	< LOD	1061

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

**Table 124. 2,3,3',4,4'-Pentachlorobiphenyl (PCB 105) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of serum or parts per billion) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1915
	01-02	*	< LOD	< LOD	< LOD	< LOD	2307
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	665
	01-02	*	< LOD	< LOD	< LOD	< LOD	758
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1250
	01-02	*	< LOD	< LOD	< LOD	< LOD	1549
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	913
	01-02	*	< LOD	< LOD	< LOD	< LOD	1075
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	1002
	01-02	*	< LOD	< LOD	< LOD	< LOD	1232
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	635
	01-02	*	< LOD	< LOD	< LOD	< LOD	567
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	.076 (.058-.112)	409
	01-02	*	< LOD	< LOD	< LOD	< LOD	515
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	714
	01-02	*	< LOD	< LOD	< LOD	< LOD	1061

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

**Table 125. 2,3',4,4',5-Pentachlorobiphenyl (PCB 118) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of lipid or parts per billion on a lipid-weight basis) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	<b>13.1</b> (<LOD-15.1)	<b>27.0</b> (22.1-30.3)	<b>40.3</b> (32.8-47.4)	1926
	01-02	*	< LOD	<b>15.1</b> (13.0-17.5)	<b>29.0</b> (26.1-33.7)	<b>44.6</b> (39.6-48.9)	2307
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	667
	01-02	*	< LOD	< LOD	< LOD	< LOD	758
20 years and older	99-00	*	< LOD	<b>14.7</b> (12.8-17.4)	<b>28.0</b> (24.4-33.5)	<b>43.6</b> (35.6-52.3)	1259
	01-02	*	< LOD	<b>16.9</b> (15.1-18.8)	<b>32.4</b> (28.3-37.3)	<b>46.4</b> (41.1-51.0)	1549
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	<b>19.6</b> (16.6-24.4)	<b>28.0</b> (24.4-38.1)	919
	01-02	*	< LOD	<b>11.9</b> (<LOD-14.6)	<b>22.0</b> (17.6-27.1)	<b>32.7</b> (25.4-47.5)	1075
Females	99-00	*	< LOD	<b>16.7</b> (13.5-19.5)	<b>32.0</b> (27.0-40.3)	<b>46.8</b> (41.0-57.0)	1007
	01-02	*	< LOD	<b>18.7</b> (16.3-20.5)	<b>35.9</b> (31.6-40.9)	<b>48.7</b> (44.5-54.3)	1232
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	<b>17.0</b> (14.1-18.3)	<b>23.7</b> (20.9-27.1)	636
	01-02	*	< LOD	< LOD	<b>16.8</b> (12.5-21.7)	<b>26.4</b> (19.3-33.2)	567
Non-Hispanic blacks	99-00	*	< LOD	<b>18.9</b> (12.9-21.7)	<b>38.6</b> (28.4-54.4)	<b>59.7</b> (45.7-80.8)	413
	01-02	*	< LOD	<b>15.6</b> (12.6-19.9)	<b>37.3</b> (26.1-46.4)	<b>54.9</b> (40.0-66.6)	515
Non-Hispanic whites	99-00	*	< LOD	<b>13.1</b> (<LOD-15.6)	<b>25.6</b> (20.7-32.0)	<b>40.3</b> (30.4-46.8)	720
	01-02	*	< LOD	<b>15.8</b> (13.6-18.1)	<b>31.1</b> (27.1-35.7)	<b>45.3</b> (38.7-50.1)	1061

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.



**Table 126. 2,3',4,4',5-Pentachlorobiphenyl (PCB 118) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of serum or parts per billion) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	.085 (.077-.097)	.179 (.151-.196)	.259 (.217-.322)	1926
	01-02	*	< LOD	.095 (.084-.111)	.192 (.163-.224)	.293 (.267-.322)	2307
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	667
	01-02	*	< LOD	< LOD	< LOD	< LOD	758
20 years and older	99-00	*	< LOD	.099 (.087-.111)	.189 (.168-.220)	.281 (.230-.360)	1259
	01-02	*	< LOD	.109 (.095-.124)	.212 (.183-.245)	.310 (.282-.367)	1549
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	.128 (.114-.142)	.188 (.159-.217)	919
	01-02	*	< LOD	.080 (.065-.095)	.139 (.116-.167)	.208 (.162-.289)	1075
Females	99-00	*	< LOD	.110 (.088-.133)	.210 (.181-.259)	.321 (.261-.408)	1007
	01-02	*	< LOD	.125 (.102-.141)	.237 (.213-.262)	.356 (.302-.384)	1232
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	.112 (.093-.128)	.143 (.129-.183)	636
	01-02	*	< LOD	< LOD	.120 (.082-.155)	.180 (.128-.224)	567
Non-Hispanic blacks	99-00	*	< LOD	.111 (.079-.146)	.223 (.182-.322)	.399 (.259-.503)	413
	01-02	*	< LOD	.094 (.073-.121)	.213 (.165-.271)	.322 (.231-.457)	515
Non-Hispanic whites	99-00	*	< LOD	.086 (.077-.102)	.176 (.145-.199)	.250 (.202-.331)	720
	01-02	*	< LOD	.101 (.089-.119)	.205 (.172-.239)	.301 (.269-.364)	1061

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

**Table 127. 3,3',4,4',5-Pentachlorobiphenyl (PCB 126) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	<b>30.8</b> (27.2-36.3)	<b>57.1</b> (50.5-65.8)	<b>89.5</b> (66.1-110)	1238
	01-02	<b>22.7</b> (20.9-24.7)	<b>24.5</b> (22.0-26.5)	<b>40.8</b> (36.1-47.5)	<b>69.3</b> (61.6-80.8)	<b>108</b> (92.7-116)	1226
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	<b>23.8</b> (<LOD-27.5)	<b>30.6</b> (26.2-36.0)	658
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	<b>30.8</b> (27.2-36.3)	<b>57.1</b> (50.5-65.8)	<b>89.5</b> (66.1-110)	1238
	01-02	<b>22.7</b> (20.9-24.7)	<b>24.5</b> (22.0-26.5)	<b>40.8</b> (36.1-47.5)	<b>69.3</b> (61.6-80.8)	<b>108</b> (92.7-116)	1226
<b>Gender</b>							
(20 years and older)							
Males	99-00	*	< LOD	<b>27.1</b> (<LOD-30.6)	<b>44.6</b> (38.0-50.5)	<b>65.0</b> (50.5-82.8)	572
	01-02	<b>20.3</b> (18.5-22.3)	<b>23.0</b> (20.8-25.4)	<b>36.5</b> (32.8-39.4)	<b>52.6</b> (46.2-61.6)	<b>81.9</b> (61.0-101)	561
Females	99-00	*	< LOD	<b>36.6</b> (30.4-44.4)	<b>67.8</b> (55.7-83.8)	<b>99.1</b> (75.9-122)	666
	01-02	<b>25.1</b> (22.9-27.4)	<b>26.0</b> (22.8-28.8)	<b>48.6</b> (41.4-54.4)	<b>82.7</b> (71.1-96.8)	<b>116</b> (98.6-128)	665
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	99-00	*	< LOD	<b>27.5</b> (<LOD-34.3)	<b>49.0</b> (38.7-59.9)	<b>70.0</b> (57.2-82.4)	337
	01-02	<b>17.8</b> (15.5-20.4)	<b>19.6</b> (17.8-20.9)	<b>28.4</b> (26.2-33.9)	<b>47.9</b> (39.7-54.9)	<b>69.2</b> (49.3-103)	262
Non-Hispanic blacks	99-00	*	< LOD	<b>38.4</b> (29.4-46.0)	<b>75.1</b> (50.2-136)	<b>136</b> (71.4-279)	223
	01-02	<b>22.2</b> (18.2-27.0)	<b>22.1</b> (19.4-25.3)	<b>44.3</b> (37.9-51.5)	<b>76.5</b> (59.0-111)	<b>115</b> (96.1-153)	217
Non-Hispanic whites	99-00	*	< LOD	<b>29.6</b> (24.2-35.6)	<b>53.0</b> (43.2-61.2)	<b>75.0</b> (59.1-98.6)	562
	01-02	<b>23.1</b> (20.9-25.4)	<b>24.7</b> (22.0-27.6)	<b>42.0</b> (35.4-49.6)	<b>72.3</b> (63.9-82.9)	<b>114</b> (88.3-124)	663

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 128. 3,3',4,4',5-Pentachlorobiphenyl (PCB 126) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	<b>204</b> (173-232)	<b>381</b> (319-451)	<b>591</b> (479-709)	1238
	01-02	<b>147</b> (135-160)	<b>158</b> (143-175)	<b>270</b> (249-298)	<b>482</b> (436-541)	<b>730</b> (625-840)	1226
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	<b>108</b> (94.0-126)	<b>144</b> (116-196)	658
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	<b>204</b> (173-232)	<b>381</b> (319-451)	<b>591</b> (479-709)	1238
	01-02	<b>147</b> (135-160)	<b>158</b> (143-175)	<b>270</b> (249-298)	<b>482</b> (436-541)	<b>730</b> (625-840)	1226
<b>Gender</b>							
(20 years and older)							
Males	99-00	*	< LOD	<b>173</b> (147-194)	<b>271</b> (250-319)	<b>422</b> (319-560)	572
	01-02	<b>134</b> (121-149)	<b>152</b> (130-169)	<b>249</b> (233-267)	<b>399</b> (346-467)	<b>566</b> (467-693)	561
Females	99-00	*	< LOD	<b>237</b> (182-297)	<b>470</b> (402-586)	<b>684</b> (586-804)	666
	01-02	<b>159</b> (146-172)	<b>160</b> (149-184)	<b>298</b> (270-348)	<b>548</b> (483-637)	<b>818</b> (658-958)	665
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	99-00	*	< LOD	<b>184</b> (123-242)	<b>327</b> (271-381)	<b>512</b> (364-576)	337
	01-02	<b>114</b> (97.8-133)	<b>125</b> (106-150)	<b>214</b> (175-257)	<b>335</b> (272-460)	<b>585</b> (354-784)	262
Non-Hispanic blacks	99-00	*	< LOD	<b>236</b> (162-308)	<b>547</b> (356-779)	<b>941</b> (517-1600)	223
	01-02	<b>131</b> (106-161)	<b>128</b> (110-158)	<b>266</b> (214-304)	<b>532</b> (361-662)	<b>779</b> (585-1060)	217
Non-Hispanic whites	99-00	*	< LOD	<b>188</b> (157-237)	<b>329</b> (285-424)	<b>554</b> (424-666)	562
	01-02	<b>150</b> (136-164)	<b>160</b> (146-179)	<b>276</b> (249-301)	<b>486</b> (431-553)	<b>746</b> (600-937)	663

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 129. 2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of lipid or parts per billion on a lipid-weight basis) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	< LOD	<b>12.5</b> (<LOD-13.8)	<b>16.5</b> (15.5-18.0)	1907
	01-02	*	< LOD	< LOD	<b>14.2</b> (12.1-15.8)	<b>18.2</b> (15.6-20.9)	2296
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	665
	01-02	*	< LOD	< LOD	< LOD	< LOD	756
20 years and older	99-00	*	< LOD	< LOD	<b>13.5</b> (<LOD-14.7)	<b>17.5</b> (16.0-19.7)	1242
	01-02	*	< LOD	< LOD	<b>14.9</b> (13.2-16.6)	<b>19.7</b> (17.0-22.1)	1540
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	<b>12.6</b> (<LOD-14.0)	<b>16.0</b> (14.6-18.0)	912
	01-02	*	< LOD	< LOD	<b>13.6</b> (11.2-16.4)	<b>18.2</b> (14.3-22.1)	1069
Females	99-00	*	< LOD	< LOD	<b>12.8</b> (<LOD-14.7)	<b>16.3</b> (14.7-20.1)	995
	01-02	*	< LOD	< LOD	<b>14.7</b> (13.2-15.5)	<b>18.1</b> (16.2-21.0)	1227
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	631
	01-02	*	< LOD	< LOD	< LOD	< LOD	566
Non-Hispanic blacks	99-00	*	< LOD	< LOD	<b>14.6</b> (<LOD-20.5)	<b>21.6</b> (17.2-32.1)	412
	01-02	*	< LOD	< LOD	<b>15.5</b> (12.6-20.0)	<b>23.5</b> (16.4-29.4)	511
Non-Hispanic whites	99-00	*	< LOD	< LOD	<b>13.6</b> (<LOD-15.2)	<b>17.4</b> (16.0-18.9)	711
	01-02	*	< LOD	< LOD	<b>15.0</b> (13.0-17.1)	<b>19.3</b> (16.2-22.1)	1056

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

**Table 130. 2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of serum or parts per billion) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	< LOD	.085 (.075-.092)	.109 (.098-.129)	1907
	01-02	*	< LOD	< LOD	.094 (.082-.107)	.126 (.110-.140)	2296
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	665
	01-02	*	< LOD	< LOD	< LOD	< LOD	756
20 years and older	99-00	*	< LOD	< LOD	.090 (.081-.099)	.116 (.104-.139)	1242
	01-02	*	< LOD	< LOD	.104 (.089-.114)	.132 (.118-.144)	1540
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	.085 (.072-.098)	.109 (.094-.130)	912
	01-02	*	< LOD	< LOD	.092 (.078-.113)	.123 (.105-.151)	1069
Females	99-00	*	< LOD	< LOD	.085 (.075-.093)	.108 (.092-.141)	995
	01-02	*	< LOD	< LOD	.096 (.086-.104)	.134 (.111-.140)	1227
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	631
	01-02	*	< LOD	< LOD	< LOD	< LOD	566
Non-Hispanic blacks	99-00	*	< LOD	< LOD	.094 (.071-.124)	.151 (.113-.188)	412
	01-02	*	< LOD	< LOD	.096 (.079-.131)	.144 (.104-.179)	511
Non-Hispanic whites	99-00	*	< LOD	< LOD	.089 (.081-.098)	.111 (.101-.129)	711
	01-02	*	< LOD	< LOD	.104 (.089-.115)	.131 (.117-.140)	1056

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

**Table 131. 2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of lipid or parts per billion on a lipid-weight basis) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1897
	01-02	*	< LOD	< LOD	< LOD	< LOD	2294
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	654
	01-02	*	< LOD	< LOD	< LOD	< LOD	755
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1243
	01-02	*	< LOD	< LOD	< LOD	< LOD	1539
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	901
	01-02	*	< LOD	< LOD	< LOD	< LOD	1068
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	996
	01-02	*	< LOD	< LOD	< LOD	< LOD	1226
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	622
	01-02	*	< LOD	< LOD	< LOD	< LOD	566
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	405
	01-02	*	< LOD	< LOD	< LOD	< LOD	510
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	716
	01-02	*	< LOD	< LOD	< LOD	< LOD	1055

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

**Table 132. 2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of serum or parts per billion) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1897
	01-02	*	< LOD	< LOD	< LOD	< LOD	2294
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	654
	01-02	*	< LOD	< LOD	< LOD	< LOD	755
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1243
	01-02	*	< LOD	< LOD	< LOD	< LOD	1539
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	901
	01-02	*	< LOD	< LOD	< LOD	< LOD	1068
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	996
	01-02	*	< LOD	< LOD	< LOD	< LOD	1226
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	622
	01-02	*	< LOD	< LOD	< LOD	< LOD	566
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	405
	01-02	*	< LOD	< LOD	< LOD	< LOD	510
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	716
	01-02	*	< LOD	< LOD	< LOD	< LOD	1055

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

**Table 133. 2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of lipid or parts per billion on a lipid-weight basis) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1908
	01-02	*	< LOD	< LOD	< LOD	< LOD	2298
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	666
	01-02	*	< LOD	< LOD	< LOD	< LOD	758
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1242
	01-02	*	< LOD	< LOD	< LOD	< LOD	1540
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	908
	01-02	*	< LOD	< LOD	< LOD	< LOD	1069
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	1000
	01-02	*	< LOD	< LOD	< LOD	< LOD	1229
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	627
	01-02	*	< LOD	< LOD	< LOD	< LOD	564
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	411
	01-02	*	< LOD	< LOD	< LOD	< LOD	515
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	715
	01-02	*	< LOD	< LOD	< LOD	< LOD	1056

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.



**Table 134. 2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of serum or parts per billion) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 1999-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	99-00	*	< LOD	< LOD	< LOD	< LOD	1908
	01-02	*	< LOD	< LOD	< LOD	< LOD	2298
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	666
	01-02	*	< LOD	< LOD	< LOD	< LOD	758
20 years and older	99-00	*	< LOD	< LOD	< LOD	< LOD	1242
	01-02	*	< LOD	< LOD	< LOD	< LOD	1540
<b>Gender</b>							
Males	99-00	*	< LOD	< LOD	< LOD	< LOD	908
	01-02	*	< LOD	< LOD	< LOD	< LOD	1069
Females	99-00	*	< LOD	< LOD	< LOD	< LOD	1000
	01-02	*	< LOD	< LOD	< LOD	< LOD	1229
<b>Race/ethnicity</b>							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	< LOD	627
	01-02	*	< LOD	< LOD	< LOD	< LOD	564
Non-Hispanic blacks	99-00	*	< LOD	< LOD	< LOD	< LOD	411
	01-02	*	< LOD	< LOD	< LOD	< LOD	515
Non-Hispanic whites	99-00	*	< LOD	< LOD	< LOD	< LOD	715
	01-02	*	< LOD	< LOD	< LOD	< LOD	1056

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

**Table 135. 3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in pg/g of lipid or parts per trillion on a lipid-weight basis) for the U.S. population, National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	<b>36.4</b> (33.8-40.3)	<b>47.8</b> (42.8-51.0)	1240
	01-02	<b>17.9</b> (16.0-19.9)	<b>19.0</b> (16.8-21.9)	<b>33.1</b> (27.5-38.6)	<b>50.0</b> (43.9-55.0)	<b>60.7</b> (55.8-65.8)	1223
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	648
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	<b>36.4</b> (33.8-40.3)	<b>47.8</b> (42.8-51.0)	1240
	01-02	<b>17.9</b> (16.0-19.9)	<b>19.0</b> (16.8-21.9)	<b>33.1</b> (27.5-38.6)	<b>50.0</b> (43.9-55.0)	<b>60.7</b> (55.8-65.8)	1223
<b>Gender</b> (20 years and older)							
Males	99-00	*	< LOD	< LOD	<b>38.1</b> (33.8-42.3)	<b>45.7</b> (40.8-52.8)	572
	01-02	<b>20.2</b> (17.8-22.8)	<b>22.0</b> (18.5-25.3)	<b>36.0</b> (29.5-43.2)	<b>53.0</b> (45.8-56.9)	<b>60.6</b> (55.7-69.0)	559
Females	99-00	*	< LOD	< LOD	<b>34.6</b> (30.9-40.6)	<b>48.3</b> (39.4-52.0)	668
	01-02	<b>16.0</b> (14.2-18.1)	<b>16.8</b> (14.7-19.2)	<b>30.1</b> (24.5-36.5)	<b>46.0</b> (40.7-51.9)	<b>60.9</b> (52.2-70.0)	664
<b>Race/ethnicity</b> (20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	<b>33.6</b> (29.5-38.1)	335
	01-02	*	< LOD	<b>15.0</b> (11.3-18.3)	<b>24.6</b> (18.3-32.3)	<b>32.3</b> (26.3-39.6)	260
Non-Hispanic blacks	99-00	*	< LOD	< LOD	<b>41.3</b> (34.6-52.2)	<b>53.2</b> (44.3-65.6)	224
	01-02	<b>17.2</b> (15.4-19.1)	<b>18.3</b> (15.7-20.0)	<b>31.7</b> (25.8-35.4)	<b>47.3</b> (41.1-53.9)	<b>54.8</b> (48.3-64.5)	217
Non-Hispanic whites	99-00	*	< LOD	< LOD	<b>36.6</b> (33.5-41.8)	<b>48.1</b> (41.8-51.6)	568
	01-02	<b>19.5</b> (17.2-22.2)	<b>21.4</b> (17.4-24.7)	<b>36.0</b> (29.6-41.1)	<b>53.5</b> (47.0-58.3)	<b>64.3</b> (59.2-72.8)	662

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 136. 3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in fg/g of serum or parts per quadrillion) for the U.S. population National Health and Nutrition Examination Survey (1999-2000, aged 12 years and older; 2001-2002, aged 20 years and older).

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 20 and older</b>	99-00	*	< LOD	< LOD	<b>240</b> (227-261)	<b>303</b> (281-339)	1240
	01-02	<b>115</b> (103-129)	<b>125</b> (108-146)	<b>217</b> (189-253)	<b>343</b> (299-374)	<b>416</b> (379-490)	1223
<b>Age group</b>							
12-19 years	99-00	*	< LOD	< LOD	< LOD	< LOD	648
	01-02	†	†	†	†	†	†
20 years and older	99-00	*	< LOD	< LOD	<b>240</b> (227-261)	<b>303</b> (281-339)	1240
	01-02	<b>115</b> (103-129)	<b>125</b> (108-146)	<b>217</b> (189-253)	<b>343</b> (299-374)	<b>416</b> (379-490)	1223
<b>Gender</b>							
(20 years and older)							
Males	99-00	*	< LOD	< LOD	<b>245</b> (223-276)	<b>298</b> (274-341)	572
	01-02	<b>133</b> (117-152)	<b>151</b> (130-168)	<b>244</b> (198-293)	<b>363</b> (309-409)	<b>446</b> (372-529)	559
Females	99-00	*	< LOD	< LOD	<b>240</b> (214-264)	<b>310</b> (273-347)	668
	01-02	<b>102</b> (90.0-115)	<b>107</b> (91.0-123)	<b>194</b> (170-234)	<b>318</b> (282-368)	<b>391</b> (373-462)	664
<b>Race/ethnicity</b>							
(20 years and older)							
Mexican Americans	99-00	*	< LOD	< LOD	< LOD	<b>235</b> (190-295)	335
	01-02	*	< LOD	<b>97.6</b> (79.3-138)	<b>184</b> (143-250)	<b>262</b> (179-341)	260
Non-Hispanic blacks	99-00	*	< LOD	< LOD	<b>262</b> (192-334)	<b>334</b> (265-505)	224
	01-02	<b>101</b> (91.2-113)	<b>103</b> (88.0-118)	<b>190</b> (147-234)	<b>295</b> (261-328)	<b>361</b> (309-423)	217
Non-Hispanic whites	99-00	*	< LOD	< LOD	<b>244</b> (226-273)	<b>298</b> (276-347)	568
	01-02	<b>127</b> (112-144)	<b>145</b> (124-157)	<b>229</b> (195-275)	<b>368</b> (317-388)	<b>438</b> (388-515)	662

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Data not collected for this age group for these years.

**Table 137. 2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189) (lipid adjusted)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of serum or parts per billion) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 2001-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	01-02	*	< LOD	< LOD	< LOD	< LOD	2298
<b>Age group</b>							
12-19 years	01-02	*	< LOD	< LOD	< LOD	< LOD	752
20 years and older	01-02	*	< LOD	< LOD	< LOD	< LOD	1546
<b>Gender</b>							
Males	01-02	*	< LOD	< LOD	< LOD	< LOD	1070
Females	01-02	*	< LOD	< LOD	< LOD	< LOD	1228
<b>Race/ethnicity</b>							
Mexican Americans	01-02	*	< LOD	< LOD	< LOD	< LOD	564
Non-Hispanic blacks	01-02	*	< LOD	< LOD	< LOD	< LOD	514
Non-Hispanic whites	01-02	*	< LOD	< LOD	< LOD	< LOD	1057

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

**Table 138. 2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189) (whole weight)**

Geometric mean and selected percentiles of serum concentrations (in ng/g of serum or parts per billion) for the U.S. population aged 12 years and older, National Health and Nutrition Examination Survey, 2001-2002.

	Survey years	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)				Sample size
			50th	75th	90th	95th	
<b>Total, age 12 and older</b>	01-02	*	< LOD	< LOD	< LOD	< LOD	2298
<b>Age group</b>							
12-19 years	01-02	*	< LOD	< LOD	< LOD	< LOD	752
20 years and older	01-02	*	< LOD	< LOD	< LOD	< LOD	1546
<b>Gender</b>							
Males	01-02	*	< LOD	< LOD	< LOD	< LOD	1070
Females	01-02	*	< LOD	< LOD	< LOD	< LOD	1228
<b>Race/ethnicity</b>							
Mexican Americans	01-02	*	< LOD	< LOD	< LOD	< LOD	564
Non-Hispanic blacks	01-02	*	< LOD	< LOD	< LOD	< LOD	514
Non-Hispanic whites	01-02	*	< LOD	< LOD	< LOD	< LOD	1057

< LOD means less than the limit of detection, which may vary for some chemicals by year and by individual sample. See Appendix A for LODs.

\* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.



## Results by Chemical Group

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### Non-dioxin-like Polychlorinated Biphenyls

